Roll No: ---------------------------

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program: B Tech Civil Engineering	**Semester – III**
Subject (Course): Surveying	**Max. Marks : 100**
Course Code : CEEEG 235	**Duration : 3 Hrs**
No. of page/s: 3	

Set A

Assume the suitable values wherever required

Attempt all the questions

Section A (4 x 5 = 20)

Q1. Explain the principle of surveying with the help of an example. [CO1] (4)

Q2. The following perpendicular offsets were taken from a chain line to an irregular boundary:

Chainage (m)	0	30	60	90	120	150	180	210
Offset lengths (m)	0	2.65	3.80	3.75	4.65	3.60	5.00	5.80

Calculate the area between the chain line and the irregular boundary by Simpson's rule. [CO2] (4)

Q3. Explain the temporary adjustments of a transit theodolite. [CO3] (4)

Q4. The stadia readings with horizontal sight on a vertical staff held 50 m from a tacheometer were 1.285 m and 1.780 m. The focal length of the object glass was 25 cm. The distance between the object glass and the vertical axis of the tacheometer was 15 cm. Calculate the stadia interval. [CO4] (4)

Q5. A circular curve has a 200 m radius and 65° deflection angle. Calculate:

(i) Apex distance, and

(ii) Mid-ordinate. (Assume chord length of 30m) **[CO5] (4)**

Section B (10 x 4 = 40)

Q6. The following observations were taken during the testing of a dumpy level.

Instrument at	Staff readings at	
	A	B
A	1.275	2.005
B	1.040	1.660

Is the instrument in adjustment? To what reading should the line of collimation be adjusted when the instrument is at B? **[CO1]**
(10)

Q7. A railway embankment is 12 m wide. The ground is level in a direction transverse to the centre line. Calculate the volume contained in a 100 m length by trapezoidal rule and prismoidal rule, if the side slope is 1.5:1. The centre heights at 20 m interval are 3.7 m, 2.6 m, 4.0 m, 3.4 m, 2.8 m, 3.0 m, 2.2 m. **[CO2] (10)**

Q8. With the help of an example, explain how you will measure the height of an inaccessible building if you are given a tape and a theodolite? **[CO3] (10)**

Q9. Determine the gradient from a point P to another point Q from the following observations made with a tacheometer fitted with an anallactic lens. The constant of the instrument was 100 and the staff was held vertical. **[CO4] (10)**

Instrument station	Staff station	Bearing	Vertical angle	Staff readings (m)
R	P	130°	+ 10°32′	1.255, 1.810, 2.365
	Q	220°	+ 5°06′	1.300, 2.120, 2.940

Section C (20 x 2 = 40)

Q10. A) It is required to set out a curve of radius 100 m with pegs at approximately 10 m centre. The deflection angle is 60°. Draw up the data necessary for pegging out the curve by each of the following methods:

- **(i) Offsets from long chord (4)**
- **(ii) Chord bisection (4)**
- **(iii) Offsets from tangent (6)**

B) Explain the characteristics of contours. Also show that a closed contour line with one or more higher ones inside it represents a hill. [CO5+CO1] (14+6)

OR

Q10. In making a survey for a new road, the intersection point of two straights was found to be inaccessible. Four points P, Q, R, S (see Fig.) were therefore selected two on each straight, and the distance between Q and R was found to be 122.20 m. If the angle PQR was 169°47'40'' and the angle QRS 148°22'2'', draw up a table of deflection angles and chainage for setting out a 200 m radius curve by pegs driven at every 20 m through chainage. Chainage of Q = (140 + 90) chains. [CO5] (20)

Q11.A) Explain the principle of stadia method. Derive the distance equation used in tacheometry. Explain how the deflection angles can be measured with the help of a theodolite? [CO3, CO4] (6+6)

B) The following table gives the corrected latitudes and departures (in metres) of the sides of a closed traverse PQRS.

Side	Latitude		Departure	
	N	S	E	W
PQ	128		9	
QR	15		258	
RS		143	9	
SP	0			276

Compute its area by (i) D.M.D. method, and (ii) M.D. method. [CO2] (8)

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Section A (4 x 5 = 20)

Q1. The area of the plan of an old survey plotted to a scale of 10 m to 1 cm now measures as 90.5 cm^2 as found by a planimeter. The plan is found to have shrunk so that a line originally 10 cm long now measures 9.5 cm only. A note on the plan also states that the 20 m chain used was 9 cm too short. Find the true area of the survey. [CO1] (4)

Q2. A series of perpendicular offsets were taken from a survey line to a curved boundary:

Distance (m)	0	10	20	30	40	50	60	70
Offset (m)	2.2	2.6	0.85	1.24	2.05	1.66	1.00	0.84

Calculate the area between the chain line and the irregular boundary by trapezoidal rule. [CO2] (4)

Q3. Explain the different errors in theodolite. How are they eliminated? [CO3] (4)

Q4. A levelling staff is held vertical at distances of 100 m and 300 m from the axis of a tacheometer and the staff intercept for horizontal sights are 0.99 m and 3.00 m,

respectively. Find the constants of the instrument. **[CO4] (4)**

Q5. A circular curve has a 200 m radius and 65° deflection angle. Calculate:

(i) Tangent Length, and

(ii) Degree of curve. (Assume chord length of 30m) **[CO5] (4)**

Section B (10 x 4 = 40)

Q6. The following notes refer to the reciprocal levels taken with one level:

Instrument station	*Staff readings on* *A*	*B*	*Remarks*
A	1.03	1.630	Distance *AB* = 800 m
B	0.95	1.540	R.L. of *A* = 450 m

Find:

- **(i) true R.L. of B**
- **(ii) combined correction for curvature and refraction**
- **(iii) the error in collimation adjustment of the instrument.** **[CO1] (10)**

Q7. A road embankment is 8 m wide and 200 m in length, at the formation level, with a side slope of 1.5:1. The embankment has a rising gradient of 1 in 100 m. The ground levels at every 50 m along the centre line arc as follows:

Distance (m)	0	50	100	150	200
R.L. (m)	164.5	165.2	166.8	167	167.2

The formation level of zero chainage is 166 m. Calculate the volume of earthwork.

[CO2] (10)

Q8. With the help of an example, explain how will you locate the intersection of two straight lines? **[CO3] (10)**

Q9. Two sets of tacheometric readings were taken from an instrument station A (R.L. = 100.00 m) to a staff station B as shown below:

Instruments	*P*	*Q*
Multiplying constant	100	95
Additive constant	0.30	0.45
Height of instrument	1.40 m	1.45 m
Staff held	Vertical	Normal

Instrument	*Instrument station*	*Staff station*	*Vertical angle*	*Stadia readings*
P	*A*	*B*	5°44′	1.090, 1.440, 1.795
Q	*A*	*B*	5°44′	?

Determine: (i) The distance between instrument station and staff station.

(ii) The R.L. of staff station B. **[CO4] (10)**

Section C (20 x 2 = 40)

Q10. A) Two straights AB and BC intersect at a chainage of 4242.0 m. The angle of intersection is 140°. It is required to set out a 5° simple circular curve to connect the straights. Calculate all the data necessary to set out the curve by the method of offsets from the chord produced with an interval of 30 m. **[CO5] (10)**

B) The following consecutive readings were taken with a level and a 4.0 m staff on a continuously sloping ground at a common interval of 30 m: 0.780, 1.535, 1.955, 2.430, 2.985, 3.480, 1.155, 1.960, 2.365, 3.640, 0.935, 1.045, 1.630, and 2.545. The reduced level of the first point A was 180.750 m. Rule out a page of a level field book and enters the above readings. Calculate the reduced levels of the points by the collimation system and the rise and fall system. Also calculate the gradient of the line joining the first and the last points.

[CO1] (10)

OR

Q10. Two straights intersecting at a point I have the following bearings, IA 270°, IC 110°. They are to be joined by a circular curve which must pass through a point D which is 150 m from I and the bearing of ID is 260°. Find the required radius, tangent lengths, length of curve and setting-out angle for a 30 m chord. [CO5] (20)

Q11.A) Derive the elevation and the distance formulae for staff vertical and the inclined line of sight. Explain how the magnetic bearing can be measured with the help of a theodolite? [CO3, CO4] (6+6)

B) In Fig., the coordinates are given is metres with the first number in parentheses being the north coordinate and the second, the east coordinate. Compute the area of the figure using coordinate method [CO2] (8)